

July 29, 2021

VIA ELECTRONIC MAIL

Jonathan Evans, Presiding Officer
New Hampshire Site Evaluation Committee
21 Fruit Street, Suite 10
Concord, New Hampshire 03301

**Re: Docket No. 2021-02
Investigation of Complaints
Regarding Antrim Wind Energy Facility**

Dear Mr. Evans:

Contained herein are responsive comments regarding the subcommittee's July 15, 2021 *Proposed Recommendation to the Site Evaluation Committee Concerning Charge 1* ("Proposal"). We carefully reviewed the subcommittee's three recommendations for "the appropriate methodologies for measurement and analysis of sound." We agree with the subcommittee's first recommendation which essentially restates the SEC's day/night limits for wind turbine noise in Site 301.14(f)(2)(a). We agree in part with the subcommittee's second recommendation that Antrim Wind turbine sound measurements be conducted in accordance with the ANSI S12.9 Part 3 standard ("ANSI Standard").

Regarding the subcommittee's third recommendation, defining a time interval for Leq measurements, we find the subcommittee has misunderstood fundamental aspects of the ANSI Standard.¹ Language in the Proposal also suggests the subcommittee is confused by Site 301.18(e)(6) and what the 0.125-second compliance interval for Leq means. We do our best in this letter to highlight the subcommittee's errors, but it is deeply troubling that such errors occurred, especially given the weight the subcommittee placed on complying with the standard. We respectfully encourage the subcommittee to withdraw the Proposal and invite an impartial expert to provide guidance.² The subcommittee owes it to the SEC and the NH public at large to better understand the facts in this matter before issuing a final recommendation. If the Proposal as written is adopted, the SEC's finding of no unreasonable adverse effect on health and safety would be voided. *See* SEC Docket No. 2015-02 Antrim Wind Decision and Order, March 17, 2017 at 153.

For the record, most of the signers to this letter participated in all or several of the wind-energy related SEC dockets and were instrumental in the enactment of RSA 162-H:10-a (2014) which led

¹ Throughout this document, the term "compliance interval" with or without Leq refers to the parameter 't' in Leq(t) for determining compliance with the SEC noise standard in Site 301.14(f)(2)(a).

² *See* subcommittee letter April 23, 2021 (stating request to obtain the services of an independent third party noise expert). https://www.nhsec.nh.gov/projects/2021-02/letters_memos_correspondance/2021-02_2021-04-23_subcommittee_ltr_to_sec_mtg_minutes.pdf

to detailed rulemaking for wind energy siting. Many of these same signers actively participated in the SB99 Health and Safety stakeholder group and attest here that it was the stakeholder group's intention that the SEC's "shall not exceed" precedent established in the Lempster, Groton, and Antrim Wind (2012) dockets be preserved even under an Leq standard.

I. Leq and Turbine Noise

There is no dispute that Site 301.14(f)(2)(a) requires NH-sited wind energy facilities to meet an Leq standard. However, it is a fact that Leq average values provide little information on whether measured sound levels are intolerable (or tolerable) for the public. The Leq metric is often numerically lower than many of the A-weighted sound levels it represents despite all sounds being included in the measurement. The WHO guidelines warn of the limitations of Leq particularly when the sound emissions "vary periodically to create a throbbing or pulsing sensation." *See* 1999 WHO Guidelines at §2.3.

Wind turbine noise is not continuous but can vary substantially and rapidly within a short period of time. Leq sound measurements taken at approximately 3800-feet from the Antrim facility show turbine sound levels dominating the acoustic environment with pronounced whooshing typical of blade pass modulations at depths of 4 to 11 dB.³ *See* Rand Acoustics, LLC April 2021 available at https://www.nhsec.nh.gov/projects/2021-02/public_comments/2021-02_2021-05-14_sound_monitoring_report.pdf.

In order to ensure the public is properly protected, the Leq compliance interval in any noise standard (t in $Leq_{(t)}$), should be appropriately matched to the characteristics of the source sound. The 0.125-second interval in Site 301.18(e)(6) was selected for this purpose.

Commenters in this docket have rightfully warned that turbine sound exceedances would go undetected under a long-term averaging scheme. The subcommittee dismissed this concern as general ignorance of "averaging" and claimed it had no "evidence or materials before it that LAeq is used to shield excessive sound noise." *See* Proposal at paragraph 73.

To be clear, no one providing comment on this issue has stated that Leq is based on arithmetic averaging. The dispute before the subcommittee centers on the compliance interval for Leq measurements. Increasing the Leq compliance interval to 1-hour, 10-minutes or even 5-minutes flattens the amplitude modulation of turbine noise on paper leaving the false impression that louder noise levels experienced by neighbors are not occurring. The subcommittee's claim that it has no evidence or materials showing this effect is incorrect. *See* Linowes slides of June 17, 2021 (slide 3 showing the "practical application of averaging turbine sound data") available at https://www.nhsec.nh.gov/projects/2021-02/documents/2021-02_2021-07-01_comment_linowes_att.pdf. *Also see* Rand Letter July 29, 2021.

³ The Rand survey is not unique. Antrim Wind's principle consultant for post-construction monitoring, Michael Bahtiarian, documented similar amplitude modulation in Falmouth, MA (2015) and Kingston, MA (2013) with a frequencies and periods consistent with blade passage rates *See* O'Donnell Wind Turbines Noise Evaluation available at Kingston, MA https://windwisema.files.wordpress.com/2013/05/2013-05-23-o_donnellwindturbineevaluation.pdf.

The subcommittee's Proposal, if adopted, would change the NH SEC sound standard for wind turbines from a not-to-exceed 45/40 dBA Leq_(0.125 s) to a not-to-exceed 45/40 dBA Leq_(≥5 minute). It would also leave the final determination of the compliance interval to the judgement of the individual conducting the sound test. See Proposal at paragraph 77. Remarkably, the subcommittee, which claims it lacks the discretion to “determine, post-certificate what the compliance standard will now be,” has contrived a new Leq metric that will have the immediate effect of gutting the NH SEC sound standard for turbine noise and essentially hand compliance authority to parties with no regulatory authority or obligation to protect public health and safety. See Proposal at paragraph 68. A change of this scale appears to be rulemaking.

II. Forcing Compliance with ANSI S12.9 Part 3

The subcommittee has determined there is no need to resolve the factual dispute over the compliance interval since “an Leq of 0.125-seconds is not supported by the language of the rules.” The subcommittee justifies this position in part by claiming the compliance interval is inconsistent with the ANSI Standard where Site 301.18(e)(1) requires post-construction monitoring to comply with the standard. See Proposal at paragraphs 37, 38.

The purpose of the ANSI Standard is to provide professional guidance for conducting short-term sound measurements with an observer present.⁴ It is general by design and contains no specific guidance regarding wind turbine noise. The standard makes no attempt to recommend or mandate appropriate compliance intervals (Leq) for community sound levels, nor should it. It is meant to apply to as many sound survey scenarios as possible. Site 301.14(f)(2)(a) and Site 301.18 *are solely the jurisdiction of the SEC*.

Nonetheless, in its effort to prove an alleged inconsistency, and correct for it, the subcommittee created a mandated Leq compliance interval from the ANSI Standard where none exists.

The 5-minute measurement period mentioned in the ANSI Standard at §§6.5, 6.6 was selected by the subcommittee as its recommended minimum compliance interval for Leq. The 5-minute period is nothing more than a suggested time period or duration for taking sound measurements when the source sound is steady and there is a need to shorten the on-site measurement time. See ANSI Standard at §6.5. For more complex measurement conditions the standard suggests the “basic measurement period” be used but prescribes no duration. ANSI defines the basic measurement period as the “planned duration and time of occurrence in a day, day of week, or time of year for measurement of the sound from a source.” See ANSI Standard at §3. In other words, the basic measurement period is the point in time and duration when a sound measurement is done. The period should coincide with a time when the source is operating.⁵ Since the ANSI S12.9 Part 3 standard applies to *short-term attended measurements*, various durations are mentioned ranging from several minutes to several hours but none of mandated, for good reason.

⁴ The full title of the ANSI S12.9 Part 3 standard is “Quantities and Procedures for Description and Measurement of Environmental Sound — Part 3: *Short-term Measurements with an Observer Present*.”

⁵ The Standard uses the example of air-conditioning system which “is best measured when the ambient temperature is warm and it [the AC system] is in normal use.” See Standard at 3.

The subcommittee states, without basis, that while the standard does not prescribe a duration for the basic measurement period, “*it is plainly meant to be longer than the period used in the “accelerated” methods.*” *See* Proposal at paragraph 45.

a) Error 1: Selecting an arbitrary measurement period for Leq compliance

The subcommittee defends the minimum 5-minute time period by first expressing its agreement with Antrim Wind that a 0.125-second Leq is inconsistent with the ANSI standard, and second by claiming that “a time period as short as 0.125 seconds for measuring Leq is not mentioned anywhere in the Standard.” *Id.*

The subcommittee is wrong on both counts.

- **Mr. O’Neal stated that the SEC rules were consistent with the ANSI standard.** *See* Transcript of June 17, 2021, Docket No. 2021-02, at 61 (stating “So I’m just going to conclude with the SEC rule is consistent with ANSI standards and other jurisdictions”).
- **All measurements in the ANSI standard call for short-term Leqs using an interval of 0.1-second.** The sections in the standard where the short time interval is cited are §3.6, §6.5(b)(1), §6.6(b)(1), §6.7.3(c), §6.7.3(d), and §6.7.2(e).

Thus, for accelerated measurements (§§6.5, 6.6), the standard first defines both the Leq metric (0.1 second) and the measurement duration (5 minutes). From there, any other number of Leqs could be determined to meet a regulatory standard or ordinance including Leq_(0.1 s), Leq_(1 s), Leq_(10 s), Leq_(1 min), or Leq_(5 min).

Obviously, it is not the intent of a general standard such as ANSI to mandate an Leq compliance interval, nor is it appropriate for the subcommittee to expect the standard to dictate the State of New Hampshire’s regulatory sound limit for operating wind turbines. The SEC has a statutory obligation to ensure a permitted facility does not produce an unreasonable adverse effect on public health and safety. Yet, the subcommittee selected an arbitrary *measurement period* to serve as the statewide Leq compliance interval for turbine noise without even a technical review to understand the errors and impacts of its recommendation. Further, a noise limit standard as open-ended as that proposed by the subcommittee suggests an intent that is less about resolving the question of the Leq compliance interval and more about getting the issue off their plate as soon as possible.

b) Error 2: Misconstruing the 0.125-second compliance interval

The fact that the subcommittee focused on measurement periods in the standard but missed all references to short-term Leq suggests a general confusion about the standard and what the Leq 0.125-second defined in Site 301.18(e)(6) means. Clues as to the depth of the subcommittee’s confusion are apparent in paragraphs 43 and 44 of the Proposal.

The ANSI Standard explains how data collected during the measurement period are broken into smaller manageable blocks (minimum 1 second) and each is individually examined for transient

noise contamination.⁶ *See id.* at §6.7. If a transient sound is identified, the contaminated Leq data that's read directly from the meter is bracketed and removed and the remaining good data is concatenated together. An alternate method involves stopping the meter in real time when the transient sound occurs and restarting when the sound is no longer audible.

The subcommittee's statement that "removal of transient background noises would be impossible under the ANSI Standard using a basic measurement period of 0.125 seconds" is meaningless. There is no interpretation of the SEC rules that suggests the 0.125-second compliance interval represents a measurement period nor has any interested party, other than perhaps Robert O'Neal, made this case. The mechanical process of removing transient sounds from source sound data is independent of the Leq compliance interval. For that matter, it is only after all transient sounds (and continuous background sounds as warranted) have been removed that a final compliance Leq is computed.

III. Other Comments

This sections lists several other concerns we identified with the subcommittee's Proposal.

a. Antrim Wind Position

Experts for Antrim Wind agree that the SEC rules are consistent with the ANSI Standard. However, Antrim Wind has complained that the 0.125-second Leq compliance interval is inconsistent with the SEC rules, specifically Site 301.18(g) relating to reporting LA10, LA90, LC10, and LC90. *See* Proposal at paragraph 35. Here we believe Antrim Wind misunderstands the rule. LA10, LA90, LC10, and LC90 are statistical values computed from the sound data. They are not measurements. The Leq 0.125-second compliance interval cited in Site 301.18(e)(6) applies to *sound measurements*. *Also see* Rand July 1, 2021 *Measuring L90 Using 1/8 Second Interval Measurements*.

This is also an area in the rules that the SB99 stakeholder group considered best left to the ANSI standard. It is for this reason also that the rules do not define the measurement period for determining L90. For L90, the ANSI Standard recommends basic measurement period of 10 minutes.

b. Differences between the Rules and ANSI S12.9 Part 3

In its proposal, the subcommittee places significant weight on maintaining consistency with the ANSI Standard. We agree in part with this recommendation. The SB99 stakeholder group recommended adherence to the standard under Site 301.18(e)(1) in order to avoid reiterating measurement methods in the rules that were already well established. Still, there are provisions defined in the rules that differ from the ANSI Standard. For example, Site 301.18(e)(1) requires wind speeds at the microphone be less than 3 meters per second during a survey while the standard allows for wind speeds up to 5 meters per second. *See* ANSI Standard at 8.

⁶ Small blocks of time are used in order to more precisely identify and remove the transient sound data thereby minimizing the amount of good sound data that's lost.

The subcommittee's recommendation raises the question of whether those areas of difference between the rules and the standard would be voided. The effect of such a change deserves closer review.

c. Site 301.18 and the Basic Measurement Period

The SEC rules do not specify a basic measurement period. This is left to the person(s) conducting the survey. However, an example can be found at Site 301.18(e)(1) for attended measurements which states that "...measurements shall include at least one nighttime hour where turbines are operating at full sound power with winds less than 3 meters per second at the microphone." The specifics of the measurement (turbines operating at full power with low winds at the microphone), the time of day (nighttime) and the duration (at least 1 hour) are all conditions determined prior to the test. None of these conditions involve the Leq compliance interval.

d. Regulatory History and Administrative Intent

Most of the signers to this letter have been actively engaged in NH wind energy siting issues for a decade or more. We understand the learning curve on these complex issues particularly with regard to turbine noise which is highly variable and where the science of sound measurement is difficult to grasp. There is substantial information in the SEC's administrative and regulatory record dating back to 2006 that speaks to the intent of the SEC when it adopted Rule 301.18(f)(2)(a) and Rule 301.18.

Yet, in reading section C of the Proposal, we were struck by the how dismissive the subcommittee was on key points in the record except when the record furthered its argument for consistency with ANSI. *See* Proposal at paragraph 49. To bolster its perceived importance of the ANSI Standard the subcommittee points to minor references to standards in the rulemaking record. *See Id.* at paragraph 63. At the same time it dismisses outright the SEC's actions in Lempster, Groton, and Antrim Wind (2012) as "not a useful indicator" of Committee intent behind Site 301.14(f)(2)(a), even though the language in Site 301.14(f)(2)(a) is clearly derived from those decisions. The Lempster, Groton, and Antrim Wind (2012) decisions mandate "not-to-exceed" sound standards whereas the SEC rule applies an Leq standard with a short compliance interval i.e. Leq(0.125-second). *Id.*

The subcommittee also argues that since a compliance interval of 0.125-second is essentially the same as Lmax, and since Lmax is not mentioned anywhere in the rules, then a 0.125-second compliance interval for Leq is not supported by the language in the rules. *See* Proposal at paragraph 37. This is a remarkable conclusion considering the comments the subcommittee identified from the rulemaking transcripts such as "not-to-exceed," and "[T]his is setting an absolute standard not to be exceeded." *See* Proposal at paragraph 56.

The subcommittee dismisses these inconvenient "stray comments" as not important indicators of administrative intent. But the undersigned who participated in the rulemaking proceedings understood that Rule 301.18(e)(6) was intended to serve as the 0.125-second compliance interval for Leq thereby establishing a maximum, not-to-exceed wind turbine sound standard. *Id.* at paragraphs 55-57.

The fact that the compliance interval is cited under NH Site 301.18 does not alter its purpose. The subcommittee noted this fact during rulemaking. *See* Docket 2014-04 TR 09-29-2015 at 141 (where Chairman Honigberg states: "...this [301.14(f)(2)] is where the standard is set, and [301.]18 is where you explain how and where you test.") Site 301.18(e)(6) is the only point in the SEC rules where a compliance interval is ascribed for Leq.

IV. Concluding Remarks

We trust these comments are informative. In closing we encourage the subcommittee to withdraw the Proposal and invite an impartial expert to provide guidance. If you have any questions regarding this letter, please to not hesitate to contact Lisa Linowes at 603-838-6588 or by email at lisa@linowes.com.

Respectfully,

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